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Research Visibility. The Vocational Education Curriculum.

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Ten reports reviewed in this issue pertain to these topics related to vocational education curriculum: (1) "Curriculum Development Projects" relates information on four curriculum development efforts and a journal on this subject. (2) "Curriculum Workshops" reports a national workshop on post secondary wage-earning home economics curriculums. (3) "Laboratories and Materials" presents two curriculum guides and a textbook. Also reviewed are 15 curriculum projects funded by the U.S. Office of Education and an administrators' curriculum handbook. About 75 other related publications are given in the bibliography. "Plain Talk," a continuing column by the author, relates the emphasis of current federal legislation on curriculum and the inportance of balance between program types in vocational and technical education, i.e., occupational orientation, cooperative education, and work study. (EM)

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RESEARCH VISIBILITY
*thesis / Application / Dissemination*

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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# THE VOCATIONAL EDUCATION CURRICULUM

THE EDITORS OF *Research Visibility* continue to be highly sensitive to ideas and commentary about research dissemination. The subject of research dissemination generally must be periodically re-examined and its processes improved. No doubt—to proverbially add a straw that might tax the camel's back—we need a great deal more communication and discussion of the many details and benefits of research dissemination and its ultimate relationship to research utilization.

The *Washington Monitor* (Dec. 2, 1968), which is the supplement to *Education U.S.A.* of the National School Public Relations Association, made a number of constructive comments about research dissemination, particularly as it is related to the output of R&D Centers. Of great importance, the *Monitor* announced the availability of an issue of the *Journal of Research and Development in Education** which is probably the *first* published assessment of the output of the centers (450 publications and reports of the nine R&D Centers funded by the U.S. Office of Education). The assessment indicates that too little of the "prolific output" has filtered directly into the classroom. But, happily, there are some major exceptions in the $40 million program:

* Vol. 1, No. 4, University of Georgia, Athens, Ga. 30601; $2 single issue.

- The University of Wisconsin's Cognitive Learning Center (Patterns in Arithmetic for Elementary Students).
- The University of Pittsburgh's Learning Research and Development Center (Individually Prescribed Instruction project).
- Stanford University (Microteaching Technique).
- Johns Hopkins University's Center for the Study of Social Organization of Schools and the Learning Process (follow-up studies of the Coleman Report, *The Equality of Educational Opportunity*).

Specifically related to the importance of dissemination, the *Monitor* quotes two evaluators (Yale's S.M. Brownell and Chicago's B.S. Bloom) who are in agreement that one of the weakest areas of the Centers is dissemination. "Dissemination through issuance of reports which are not read is an exercise in futility," states Brownell, while Bloom indicates that he is "skeptical" about university establishments as disseminators except to other universities and researchers. The most serious shortcoming of the Centers, according to Bloom, is the lack of dynamic models or theories. Brownell has a prescription for improvement:

> . . . more advance planning that takes school personnel as equal partners in research and gives schools a timetable for field testing and demonstration; priorities that relate to the needs of school personnel; and less emphasis upon the numbers of research studies and more upon quality control. Perhaps on each Center staff there

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## EDITOR'S NOTE

*Research Visibility* is a research project of the American Vocational Association. The purpose is to give visibility to significant research: experimental, demonstration and pilot programs; upgrading institutes, seminars and workshops; and other leadership development activities for teachers, supervisors and administrators. The *Research Visibility* report synthesizes important projects which have been reviewed, selected and analyzed for their value to vocational, technical and practical arts educators, guidance personnel, and other leaders in education, manpower and related fields. A composite bibliography of significant research and development materials is included.

The project is cooperatively financed by the American Vocational Association and a Vocational Education Act of 1963 grant (OEG 2-7-070633, project 7-0633; "Synthesis and Application of Research Findings in Vocational Education").

George L. Brandon, professor in residence (Pennsylvania State University) is editor of *Research Visibility*. He is assisted in the preparation of these reports by Research Assistant Anne Ware.

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needs to be a tough-minded person competent in research and knowledge about school practices and problems who can and will challenge each proposal with "So what?" and confront conclusions with "What is the evidence?"

***Research and Curriculum Development.*** Generally, vocationalists have had a strong bond in learning and its relationship to curriculum development. There has been strong insistence, however poorly verbalized and explained to the general public and the academic community, that learning in vocational and technical education and the practical arts is based upon *direct* experience. This pragmatic notion essentially means that education in these areas takes on *reality*—actual materials, hand and machine processes, industrial and business organization, farm and home projects, shop and laboratory experimentation, etc. In short, education in these areas is *relevant.* In many instances, the vocational cooperative education plan is used to guarantee that education is real. Regardless of the soundness of this theory of learning, it does compound the complexity of the process of curriculum making and, even more so, the research connected with it.

Traditionally, vocational and technical curriculum development has lacked the research effort necessary to create and establish models and theoretical bases; with few exceptions, surveys and status studies have been the focal points of inquiry to determine what should be taught in vocational education. Happily, and with the realization by many vocational educators that there is a real need for basic research, especially that related to curriculum development, considerable effort has been made during the past five or six years to direct investigation to curriculum development and the theory and model-making process.

At least five trends or groups of research activities are noted in this respect: (a) the cluster or family of occupations technique, (b) transferability of skills and behavior, (c) competencies and their comparison in several occupations, (d) industrial functions and their relations to common competencies of all occupations, and (e) the construction of curriculum guides. Much of this effort will possibly be the target of considerable criticism that it is too theoretical, sophisticated, "Cloud Nine," and not immediately applicable to practitioners' problems on the firing line. Possibly some of this criticism may be deserved; part of it may be the by-product of inadequate and unclear reporting, lack of communication in the same "language," or refusal of the researcher to become bogged down with the realities of practicing problems.

Notwithstanding, the importance, complexity and urgency of the curriculum development problem to the entire vocational and technical education community strongly demand some research breakthroughs which will modernize the process of curriculum development. Until modernization occurs, the vocational curriculum assumes the risk of lagging far behind the psychology of learning by direct experience and the vital combination of learning by doing and functional related information and technology. The amount and nature of research focused in the curriculum direction should, indeed, be *bold* and *imaginative!*

## TOPIC ONE: Curriculum Development Projects

See Bibliography for information on availability of complete studies

**An Empirical Procedure for Identifying and Determining the Structure of the Technical Concepts Possessed by Selected Workers.** Jerome Moss, Jr., Brandon B. Smith and David J. Pucel. Minnesota Research Coordination Unit in Occupational Education. University of Minnesota, Minneapolis. 1968.

An accurate description of cognitive competencies which are actually required for satisfactory job performance is a critical first step in the process of curriculum development. The studies at the Minnesota Research Coordination Unit (RCU) were concerned with developing and testing an "empirical, objective procedure for identifying both the technical concepts actually possessed by workers on-the-job *and* their psychological structure" (a methodology or curriculum tool that would produce a "map" of a particular worker's technical concepts).

The studies were based on several assumptions, some of which are given below:

1. There are bodies of knowledge which are related to the quality of performance in a given occupation.
2. The technical knowledge of an occupation possessed by an individual is composed of concepts of the things, processes and units of measure of that occupation.
3. Individuals organize their technical concepts into an integrated network or structure.
4. Terms or words can be viewed as verbal labels for underlying concepts.
5. Workers who are performing satisfactorily in an occupation have acquired the verbal tags necessary to identify their concepts.
6. The *associative* meaning of a concept is defined as the total free associative response distribution which a given stimulus word elicits.
7. The technical vocabulary of an occupation, which identifies the technical concepts of that occupation, can be determined by repeated administrations of a free-association instrument.

In other words, the authors believe that if good workers can be identified, free association methodology can be used to determine their technical conceptual structure. This information can make possible the mapping of the cognitive goals of instruction which can then be applied to curriculum development.

Two studies were conducted by the Minnesota RCU that were designed to test a free association methodology to find out if it could produce a reliable conceptual map with face validity for a specific occupation.

Radio and television repairmen with at least three years of trade experience who worked under similar conditions were designated by their supervisors as being flexible or

inflexible, the former being those who "satisfactorily performed a greater variety of repair tasks" than the latter. Several radio-television vocational instructors developed a list of 450 major technical words, from which 163 words were selected at random. These stimulus words were presented to the repairmen in booklet form with space allowed for them to write 25 free association responses to each stimulus word. The resulting "map" for the flexible worker group differed significantly from the "map" for the inflexible worker group. The flexible workers gave different responses; they also gave more responses than did the inflexible worker group.

The authors summarize that the studies indicate that apparently the associative methodology is (a) capable of empirically and reliably generating a conceptual map of a given occupation which appears to have face validity for experts in that occupation, and (b) sensitive enough to differentiate between workmen performing the same tasks at different qualitative levels. In addition, they realize that this methodology does not provide the detailed technical content that would be included in a curriculum.

However, they do feel that the conceptual maps produced as a result of these studies can be applied to occupational education in the following ways: (a) as a guide for selecting and organizing curriculum content; (b) to identify the associative concepts, and the conceptual relationships that are common to a group of occupations; (c) as criteria for evaluating student conceptual development or teacher's occupational competence, and (d) to explain and predict behavior, and to plan appropriate educational experiences designed to modify behavior.

**An Experimental Course of Study in Supermarket Merchandising and Management: A One-Year Course of Study.** Gordon E. Van Hooft. The University of the State of New York and The State Education Department, Albany. 1967.

In terms of dollar volume of sales and number of employees, the largest single retail enterprise in the country is the food industry. Supermarkets are responsible for 90 percent of retail food sales and the employment of 80 percent of food industry employees. The guidelines presented for this supermarket merchandising and management course include the study of food production, the history of supermarket development, preparation of entry-level supermarket trainees, organizational structure of the industry, management positions and financing, and development and supervision of an independent supermarket.

It is anticipated that a course which follows this syllabus will attain the following objectives: (a) acquaint students with the retail food industry; (b) prepare students for initial employment and future advancement; (c) improve techniques of modern supermarket management; (d) develop managerial skills applicable to other occupational areas, and (e) promote a better understanding of socio-economic responsibilities in a free competitive economy.

The course is designed to be offered in the twelfth grade for two semesters as part of an overall distributive education program. A sample cooperative curriculum follows:

| | UNITS |
|---|---|
| Introduction to business | 1 |
| Business arithmetic | 1 |
| Business law or Bookkeeping 1 | 1 |
| Distribution 1 | 1 |
| Distribution 2 and/or Supermarket Merchandising and Management | 1 or 2 |
| Store experience | ½, 1, 1½ or 2 |
| | 5½, 6, 6½, or 8 |

Details are given for instruction in such areas as food consumption, food production, supermarket location, and grocery, meat, produce, dairy, frozen food, bakery, and nonfood departments, checkout operations, and fiscal matters. A short bibliography of publications and teaching aids is given for each area.

**Electro-Mechanical Technology.** Final Report. Maurice W. Roney. The Oklahoma State University, Stillwater. 1966.

Part I, "A Field Study of Electro-Mechanical Technician Occupations," had the following objectives:

—To obtain a measure of the need for technicians with skill and knowledge encompassing both mechanical and electrical principles and applications.

—To identify skill and knowledge essential to electro-mechanical technician occupations, so that these requirements could form a basis for the development of a preparatory training program of approximately two years.

—To develop a method of occupational analysis for new and emerging occupations which require skills that cut across traditional fields of educational specialization.

In general, the study succeeded in its major objectives of identifying occupational and educational needs in the new and emerging occupation of electro-mechanical technology, and this information was used in the preparation of Part II of this study.

In Part II, "A Post-High School Technical Curriculum" has a mathematics and science base with applications in electricity, electronics and mechanics. The emphasis is on the interrelationship of electronic and mechanical phenomena in systems and devices in which those phenomena are interdependent. This knowledge is mandatory for the emerging occupations. In these occupations there are four general requirements:

—The training should put emphasis on electrical and mechanical principles rather than on specific applications of these principles.

—Communication skills should be given special attention.

—Whenever possible, electrical and mechanical principles should be studied together, and not as separate entities.

—Principles of electrical and mechanical physics are basic tools in the work of electro-mechanical technicians and all technical instruction should develop analytical skills for which these tools are fundamental. In addition, there is an increasing need for the technician to work with new applications of other physical sciences, such as optical equipment, thermal energy devices, hydraulic and pneumatic controls, and a wide variety of measuring instruments.



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The curriculum content and organization are described in detail for a four-semester course. Technical courses make up 64 percent of the total curriculum, and communications and economics make up 10 percent.

Roney also describes faculty requirements, and instructional materials. He presents a detailed description of suggested laboratory facilities, and he concludes by presenting five major recommendations:

1. New programs of electro-mechanical technology should be planned and implemented as soon as possible.
2. The major effort in developing new programs for electro-mechanical technicians should be devoted to two-year associate degree level curriculums.
3. Schools with existing programs of electronic and mechanical technology should not expect to develop electro-mechanical technology programs by assembling existing courses and utilizing existing instructional staff without further training.
4. An extensive research project should be planned and carried out to further develop and document the instructional plan proposed for the curriculum in electro-mechanical technology.
5. Research studies should be made in other emerging occupational fields which require new combinations of technical skills.

The appendixes to this document contain a chart showing employment and projected needs for technicians in 93 industrial organizations through 1970, and an example of unified concepts.

**Hospitality Education Curriculum Development Project.** Final Report. Carolyn Dommer. College of Education. Michigan State University, East Lansing, Mich. 1967.

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The basic concern of this project—to plan the present and future direction for developing vocational education programs in home economics—led to the formulation of seven major objectives:

1. To intensify the involvement of home economics in developing occupationally oriented educational programs.
2. To explore the program developmental potential of emerging occupational areas related to home economics.
3. To survey the practices employed in developing home economics occupational programs.
4. To examine selected approaches for preparing teachers to develop the occupational phase of the home economics program.
5. To develop, test and refine curriculum and instructional materials for selected occupational areas.
6. To assess the nature of key factors involved in developing occupational education programs involving home economics.
7. To create a greater awareness and deeper understanding of the components and value of a sound occupational education program among educators and citizens.

This phase of the research and development program has as its underlying purpose an exploratory vocational curriculum project. Procedures relating to the following functions were developed for this project: (a) project organization, (b) personnel development, (c) preparation of instructional material, (d) curriculum planning, (e) data collection and analysis, and (f) reporting project activities and outcomes. There were several steps involved in curriculum and instructional materials development, all of which were influenced by the general guideline that curriculum development and innovation in vocational education should be a cooperative endeavor involving the public school, other public agencies and organizations, and industrial and labor interests.

As of the date this document was published the materials developed were limited to those for internal use by the project staff or by teachers and administrators in the local schools, e.g. "working craft" program development guidelines, reference lists, bibliographies of teaching aids, and collections of job descriptions. Dommer hopes that these materials will result in the publication of a "handbook of promising practices and procedures to be used as guidelines in establishing and conducting future vocational programs." A handbook of this nature could be expected sometime after the 1967-68 school year.

The appendixes to this report contain suggested program patterns for participating in the hospitality education project, examples of occupational opportunities in the hospitality industry, conditions for participation in the project, a summary of activities of the project, and project activities of the project (through June 30, 1968).

**Curriculum Development.** Lloyd J. Phipps and Rupert N. Evans, University of Illinois, Urbana, Ill.

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In this chapter from the October 1968 issue of *Review of Educational Research,* which is devoted to vocational, technical and practical arts education, Phipps and Evans have presented a discussion of research related to curriculum development conducted since 1962. During this period several studies have been completed which, generally speaking, were more carefully designed than those completed earlier. The complexity of the field of curriculum development has forced researchers to utilize statistical tools and research designs adapted to meet its particular needs.

The literature reviewed by Phipps and Evans shows that this research has emphasized the following areas:

—The identification of content common to clusters of occupations and to all kinds of work.

—The development of curriculum for students with special needs.

—The adaptation of curriculums to changes in educational approaches and technology.

—The identification of curriculum changes required by technological developments.

—Attention to occupational areas that previously were overlooked or considered unworthy.

Phipps and Evans have included a bibliography of 67 major research studies and have noted that these are only a few of the studies conducted in this period.

Donald Maley attempted to define the "cluster concept" as it applies to the preparation of workers for a family or cluster of occupations. The results are reported in *An*

*Investigation and Development of the "Cluster Concept" as a Program in Vocational Education at the Secondary School Level;* College Park: Univ. of Maryland, 1966; 135 pages.

Charles V. Matthews and others developed *A Curriculum for Dropout-Prone Students—Delinquency Study and Youth Development Project;* Edwardsville: Southern Illinois University, 1966; 158 pages.

The new educational approach, team teaching, was studied by Raymond Agan and reported in "Vocational Guidance is Stressed," *Kansas State Teacher* 75:25-27; May 1967.

The use of the computer to allow for more flexibility in class scheduling was reported by Dwight W. Allen in *Flexibility for Vocational Education Through Computer Scheduling;* Stanford, Calif., Stanford University, 1966. 38 pages.

Cleo A. Dupy and William L. Hull gave attention to a previously overlooked occupational area in their study *Problems of Implementing Agricultural Occupations Programs in Twenty-Eight Selected Vocational Agriculture Departments.* Stillwater: Oklahoma State University, 1966; 26 pages.

## TOPIC TWO: Curriculum Workshops

See Bibliography for information on availability of complete studies

**Development of Post-High School Wage-Earning Programs in Home Economics Education Utilizing the Resource Guide, Care and Guidance of Children.** Final Report. Ruth J. Dales and Anne G. Buis. Florida State University, Tallahassee, Fla. June 1968.

The School of Home Economics, Florida State University, sponsored a National Summer Institute, July 5-28, 1967, which had the following purposes: (a) to provide assistance to persons responsible for curriculum which prepares for wage-earning in the child development area at the post-high school level; (b) to help persons responsible for these programs to make use of the curriculum resource guide, *Care and Guidance of Children,* developed recently by personnel at Pennsylvania State University, and (c) to evaluate the effectiveness of the Institute by follow-up of the participants.

The forty participants, from 34 states, represented State Departments of Education, State Departments of Public Welfare, junior college and four-year college faculties, and vocational-technical schools. Some were already involved in child development in post-high school wage-earning, and others were anticipating such involvement for themselves. The Institute utilized discussions, lectures, multisensory aids, and field trips. Six months later the participants were asked to evaluate it on a four-page form. The responses are briefly summarized below.

***Junior college participants:*** Several were instrumental in the planning, organizing and establishing of post-high school curricula in child development in their respective junior colleges and in promoting the inclusion of similar curricula in other junior colleges in their states. Some were active with inservice training courses in the child development area. They were also involved as consultants in planning new buildings for child development programs, and in revising job descriptions for teaching personnel.

***Four-year college participants:*** One participant was previously involved in a two-year program; after the Institute, two others developed curricula that were accepted for two-year post-high school programs. They have all shared their information and experiences by reporting to their colleagues, their administrators and to various civic and professional organizations.

***Area vocational-technical school participants:*** These participants returned to their teaching positions. One spoke on two television programs; another produced a 45 minute video tape on the development of wage-earning programs which was shown at the state meetings of home economics teachers, administrators and counselors. Some of the participants are making surveys to determine employment possibilities and the need for post-high school classes.

***High school teachers:*** Several have been used to work on curriculum for a two-year program. All shared materials with administrators and fellow teachers. One assisted with a district survey for child care aides and another worked with an area supervisor in the preparation of a suggested list of files and books.

***Administrators:*** There were 10 state administrators working in home economics positions at the state level. All shared their experiences with their colleagues, heads of state and local agencies and organizations and personnel at all levels concerned with preschool children. Some have acted as consultants in helping interested administrators and personnel to work on facilities and curricula, including

upgrading programs. They are attempting to construct evaluation instruments, determine minimum standards, provide more inservice training programs, revise course outlines, and reorganize curricula.

In summary, it is felt that the Institute participants are now more aware of "what a post-high school program in child development should be; this awareness has given them security and confidence to move with enthusiasm toward clearly defined goals." The appendixes to this document contain descriptions of programs in child development now available in post-high school programs, qualifications and duties of personnel needed in post-high school programs, library references, sources of pamphlets, lists of periodicals and films, and recipes for paint and clay. Also included are descriptions of nursery schools and kindergartens, health policies, a proposed budget, and examples of curricula.

**Suggested 2-Year Curriculum — Modes to Junior College, Home Economics Department 1967-68 Nursery School Assistant Teaching**

| *First Semester* | *Units* | *Second Semester* | *Units* |
|---|---|---|---|
| H.E.—Child Development | 3 | H.E.—Marriage and Family | 2 |
| Orientation | 1 | H.E.—Guidance of Young Children | 2-6 |
| English Composition | 3 | Music—Fundamentals | 2 |
| English—Children's Lit. | 2 | Music—Elem. Piano | 1 |
| Speech—Ideas, Issues and The Arts | ½ | Spanish—Intro. to Spanish | 3 |
| Speech | 3 | Sociology | 3 |
| Art (for young children) | 2 | Physical Education | ½ |
| Physical Education | ½ | | |
| | 15 | | 15½-17½ |
| *Third Semester* | *Units* | *Fourth Semester* | *Units* |
| H.E.—Nutrition | 2 | H.E.—Work Experience | 2 |
| H.E.—Equipment and Materials for Young Children | 2-6 | Health Education | 2 |
| H.E.—Child, Family, Community, Inter-relation, ships | 2 3 | U. S. History | 3 |
| American Government | 3 | Science | 3 |
| Physical Education | ½ | Psychology | 3 |
| | | Elective | 3 |
| | | Physical Education | ½ |
| | 15½-16½ | | 16½ |

## TOPIC THREE: Laboratories and Materials

See Bibliography for information on availability of complete studies

**Pretechnical Post-High School Programs: A Suggested Guide.** Walter J. Brooking. U.S. Office of Education. Washington, D.C. 1967.

An increasingly larger percentage of the Nation's work force is required to obtain an education preparing them for more technical employment as a result of the impact of technological advances.

Thousands of technician jobs remain unfilled while thousands of workers who are unskilled or untrained are seeking employment. Many youths who are capable of mastering the curriculum which is necessary to become highly skilled technicians have poorly developed scholastic skills.

Because the academic requirements for entering a high quality technical program are so similar to those for science or engineering baccalaureate degree programs, these youths are unprepared to engage in such study.

There are various reasons for a youth not developing the necessary academic skills: (a) he was graduated from high school without taking some of the required math and/or science courses; (b) he was graduated from high school with underdeveloped skills in language, arithmetic and organized science, but was actively concerned with a science-related hobby outside of school, e.g. ham radio; (c) his scholarship suffered because of part- or full-time employment while in high school; (d) he left high school before graduation. The needs of such students may be served by a pretechnical program.

More of these programs should be provided to give such students the opportunity to develop their full potential and, in so doing, enable more youths to enter technical education programs and help meet the growing need for technicians.

The pretechnical post-high school program should be the responsibility of the technical education institutions and should have as its objective the enabling of students to acquire understanding and skills in one or more subjects.

The following skills at levels equivalent to a good high school program are required in order to enter the technical program: communications (reading, writing, spelling, grammar, punctuation, speaking, listening, and language comprehension), mathematics, physics, chemistry, or biology. The program should be organized for two semesters, with courses being available for those requiring only one semester of work. The pretechnical courses required should be scheduled according to individual student needs, including introductory courses in his technical specialty which will maintain his interest and help him to fit in with other students in the institution.

There are as many kinds of technicians as there are professional scientists; for identification purposes they can be placed within three general classifications: (a) physical science and related engineering technologies (e.g., aeronautical and aerospace, chemical, instrumentation, oceanographic, printing); (b) biological science technologies (e.g., health and related technologies, and agriculture and related technologies); and (c) combined physical and biological technologies, (e.g., agricultural equipment, dairy products processing, sanitation and environmental control, scientific data processing).

Typical prerequisites for curricula in either physical science or biological-based technologies include the following: graduation from high school or equivalent; two years of mathematics, including algebra, geometry and intermediate algebra or trigonometry; one year of physics or one year of chemistry; in some cases a year of biology; competence in communication skills (three to four units of English).

These are all necessary because the student must be able to master a curriculum which meets the three major demands on technical training: (a) it should equip the graduate to take an entry job in which he will be productive; (b) it should enable the graduate to advance to

positions of increasing responsibility, and (c) it should provide a comprehensive foundation which would support further study within the graduate's field of technology.

Course outlines are provided in this guide. In addition, remarks are included on special administrative considerations, such as federal support, advisory committees and services they provide, student selection, faculty, student counseling, guidance and advisory services, and physical facilities and their cost.

**Small Engines: Care, Operation, Maintenance and Repair.** Two Volumes. American Association for Agricultural Engineering and Vocational Agriculture. Athens, Ga. June 1968.

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This is the latest in a series of teaching texts issued by the American Association for Agricultural Engineering and Vocational Agriculture (AAAEVA). Materials were obtained from more than 400 references from industry, trade associations, experiment stations, and colleges. Both volumes are cross-referenced and the editors recommend both for complete subject coverage.

Volume One gives basic engine operating principles and step-by-step procedures for the care, operation and service of 2-cycle and 4-cycle air-cooled gasoline engines and accessories. It is intended for use by those who operate and maintain engines.

Volume Two deals with the basic design and operating principles which are important for those interested in advanced maintenance and repair of 2-cycle and 4-cycle air-cooled gasoline engines. Step-by-step procedures are given along with a complete explanation for each operation.

Color diagrams, as well as photographs of actual parts, are used profusely throughout both volumes. They are all clearly marked and described. Listed below are the content areas in both volumes.

VOLUME ONE

- Small Engine Types
- Fuel Systems
- Air Cleaners
- Carburetors
- Batteries
- Starters
- Spark Plugs
- Crankcase Breathers
- Starting
- Operating
- Cleaning
- Storing
- Lubricating
- Adjusting
- Safety
- Operating troubles

VOLUME TWO

- Starters
- Ignition systems
- Fuel systems
- Governors
- Lubrication systems
- Generators
- Carburetors
- Flywheels
- Engine:
  - valves
  - cylinders
  - piston-and-rod assemblies
  - camshaft assemblies
  - crankshaft assemblies
  - cylinder heads

**Food Processing Technology: A Suggested Two-Year Post-High School Curriculum.** Robert M. Knoebel and others. U.S. Office of Education. Washington, D.C. 1967.

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This guide was prepared by agricultural and technical education specialists in the Occupations Section of the Division of Vocational and Technical Education, U.S. Office of Education, based on materials gathered by the State University of New York Agricultural and Technical College at Morrisville. Included are suggested course outlines for a food processing curriculum with descriptions of texts, procedures, laboratory layouts, library facilities, and faculty and student services. It is hoped that this guide will assist school administrators, advisory committees, supervisors, and teachers who are involved in planning new programs or evaluating current ones.

**APRIL ISSUE** . . . Next month, Research Visibility will report on studies dealing with "The Preparation of Professional Personnel."

The curriculum in this guide has been designed to meet the following requirements in order to insure functional competence in the broad field of food processing technology:

—The training prepares the graduate to be a productive employee in an entry level job.

—The broad technical training, together with a reasonable amount of experience, enables the graduate to advance to positions of increasing responsibility.

—The foundations provided by the training are broad enough to enable the graduate to do further study within his field. This further study may be reading of journals and new text materials, and formal course work.

The first year of study has the following as its goals: (a) to develop a scientific background necessary for the successful completion of future courses and to allow for a more thorough practical application of technology to a highly scientifically oriented field; (b) to motivate the student by introducing the major field of study; (c) to establish a means of verbal, graphic and written communication, and (d) to develop scientific techniques through the conduct of laboratory exercises.

The second year of study has as its goals the following: (a) to broaden the student's conception and perception of society by including courses in the social sciences, and (b) to provide maximum instruction in specialized courses to obtain the technical competency expected of the student.

CURRICULUM OUTLINE

Summer Working Experience—A Work Period in the Food Industry

| | Hours per week | | | |
|---|---|---|---|---|
| | Class | Laboratory | Study | Total |
| *First Semester:* | | | | |
| Communication Skills | 3 | 0 | 6 | 9 |
| Chemistry I | 3 | 3 | 6 | 12 |
| Microbiology | 2 | 3 | 4 | 9 |
| Mathematics I | 3 | 0 | 6 | 9 |
| Food Processing I | 3 | 0 | 6 | 9 |
| Total | 14 | 12 | 28 | 54 |
| *Second Semester:* | | | | |
| Technical Reporting, Drawing, Sketching, & Diagramming | 2 | 3 | 4 | 9 |
| Chemistry II | 3 | 3 | 6 | 12 |
| Food Microbiology | 2 | 3 | 4 | 9 |
| Mathematics II | 3 | 0 | 6 | 9 |
| Food Processing II | 3 | 4 | 6 | 13 |
| Food Grades & Standards | 0 | 2 | 2 | 4 |
| Total | 13 | 15 | 28 | 56 |

*Third Semester:*

| | | | | |
|---|---|---|---|---|
| General & Industrial Economics | 3 | 0 | 6 | 9 |
| Quantitative Chemical Procedures | 2 | 4 | 4 | 10 |
| Quality Control I | 2 | 3 | 4 | 9 |
| Food Packaging | 2 | 3 | 4 | 9 |
| Food Processing III | 3 | 4 | 6 | 13 |
| Food Industries Seminar | 2 | 0 | 4 | 6 |
| Total | 14 | 14 | 28 | 56 |

*Fourth Semester:*

| | | | | |
|---|---|---|---|---|
| Industrial Organizations & Institutions | 3 | 0 | 6 | 9 |
| Quality Control II | 3 | 4 | 6 | 13 |
| Food Plant & Environmental Sanitation | 3 | 0 | 6 | 9 |
| Food Plant Equipment | 2 | 3 | 4 | 9 |
| Food Processing IV | 3 | 4 | 6 | 13 |
| Total | 14 | 11 | 28 | 53 |

## TOPIC FOUR: Other Studies

See Bibliography for information on availability of complete studies

**Curriculum Handbook for School Administrators.** American Association of School Administrators. Washington, D.C. 1967.

In recognition of the need of school administrators for a clear, concise source of information of the myriad of new curriculum developments, the Executive Committee of the American Association of School Administrators enlisted the assistance of professionals and organizations in 15 areas to prepare this administrator's handbook. The authors were asked to identify emerging concepts in curriculum content, and in the organization and application of knowledge, and the emerging methods of instruction. The major areas discussed are art, business education, English language arts, foreign languages, health, home economics, industrial arts, mathematics, music, physical education, safety education, science, social studies, vocational education, and planning and organizing for curriculum change.

Chapter 14 is devoted to a discussion of vocational education by Lowell A. Burkett and Mary P. Allen of the American Vocational Association. They state that a vocational education curriculum is "a series of organized experiences designed by educators to prepare students for employment." Its content is derived from the world of work and organized into the broad fields of trades and industry, health, agriculture, office employment, marketing and distribution, technical work, and home economics.

Burkett and Allen identify several emerging concepts in vocational education which should be recognized and understood by school administrators as they plan instructional programs that will meet the demands of society.

—Vocational education must be made available to people of all ages in all communities.

—Vocational education programs must be related to job opportunities which actually exist and to employment and labor mobility trends which have implications for overall planning in vocational education.

—Advisory councils and committees are now mandatory at the state level and many are being established at the local level. It is now recommended that a committee be established for every vocational education curriculum offered by a school.

—Placement and follow-up of graduates can help a school to validate its curriculum. The school thus remains aware of changes in the labor market and the demands of the world of work and can make curriculum changes accordingly.

—Vocational education should not be structured as an end in itself, but should encourage lifelong learning.

—Students should be exposed to the world of work, both in their immediate environment and outside their own communities, through exploratory programs which provide insights about work that encourage consideration of a high school program and making plans for a future job.

—Schools should realistically encourage students who can benefit from it to seek vocational training as an honorable alternate to a baccalaureate program.

—Reliable data about the vocational education program and its graduates is necessary to provide the public with information that will enable it to intelligently support vocational education.

—The ultimate aim of preparing an individual to be self-supporting is shared by vocational education programs with agencies which provide health, welfare and other educational services.

Some emerging concepts in organization and administration of vocational education programs include an increased acceptance of the area vocational school by all the states, particular emphasis on programs for the disadvantaged, the use of private training facilities outside the public school system, and the recognition of a need for special administrative arrangements for metropolitan areas.

There are five specific emerging concepts in instructional techniques: (a) the team approach to teaching; (b) teaching for a cluster of occupations; (c) the cooperation of

**The Emerging Labor Force.** A five-part paper by Seymour L. Wolfbein with commentary by Herbert E. Striner, has been published by the Council on Trends and Perspectives of the Chamber of Commerce of the United States, Washington, D. C. Content focuses upon (a) patterns of future labor supply and demand, (b) potential problems, (c) a strategy for the private sector, (d) a program for the future, and (e) specific program suggestions. Significant statistics and projections of the paper are also available in color slides (35 mm) and in a script for $10 from the Audio-Visual Department of the Chamber. The publication alone is $2.50.

two or more fields of vocational service in providing occupational training for jobs for which more than one type of vocational training is needed; (d) an increased use of programed instructional materials and automated teaching devices, and (e) the evolvement of new approaches to the entire field of vocational education through experimental and demonstration programs.

**The Design and Evaluation of Vocational Technical Education Curricula Through Functional Job Analysis.** Final Report. Howard H. McFann. The George Washington University, Washington, D.C. August 1968.

It is felt that this report will be of great interest to psychologists and, because of its technical nature, only brief mention is given here. The research reported in this document is an overall effort to develop a taxonomy for classifying vocational education objectives. The purpose of the taxonomy is to provide a framework for evaluating and comparing existing programs, and eventually establishing criteria for the design and development of a radically different comprehensive curriculum.

## TOPIC FIVE: On-Going U.S.O.E. Projects in Curriculum Development

*Several projects sponsored by the U.S. Office of Education in the area of instructional materials are expected to yield significant results when completed. They are briefly described here.*

**Development and Evaluation of an Experimental Curriculum for the New Quincy Massachusetts, Vocational-Technical School.** Project No. 5-0009. Principal investigators: Maurice J. Daly, Quincy Public Schools, and Robert M. Gagne, The American Institute for Research.

This project was begun in April 1965, and will end December 1969. The objectives are to demonstrate the increased effectiveness of instruction whose content is derived from an analysis of desired behavior after graduation, and which attempts to apply newly developed educational technology to the design, conduct, and evaluation of vocational education.

**The Implementation and Further Development of Experimental Cluster Concept Programs Through Actual Field Testing and Evaluation at the Secondary School Level.** Project No. 7-0853. Principal investigator: Donald Maley, University of Maryland.

This project is of 12 months duration. Phase I of the study was reported in the February 1968 issue of *Research Visibility*. In beginning phases of the project, curriculum materials were developed for training vocational teachers for experimental programs in three occupational clusters: construction, metal forming and fabrication, and electromechanical installation and repair. This final phase of the project is dealing with the development of a program of study that will support the cluster concept of vocational education.

**Study of Curriculums for Occupational Preparation.** Project No. 8-0334. Principal investigators: Carl Schaefer and Bruce W. Tuckman of Rutgers, The State University.

This project was begun in May 1968, and will end May 31, 1970. The objectives of this project are to: (a) establish a communication link between 15 state-supported vocational curriculum laboratories; (b) develop and refine a scheme for reorganizing educational objectives in terms of the behavioral process used to accomplish each objective and the object of the process in each instance; (c) give the finalized process-object model a preliminary test on a small sample of behavior to determine its applicability and breadth, and (d) develop staff capability and a detailed program of planned curriculum undertakings in connection with the overall organic curriculum effort.

**Opportunities and Requirements for Initial Employment of School Leavers With Emphasis on Office and Retail Jobs—Phase Two.** Project No. 6-1968. Principal investigator: Fred S. Cook, Wayne State University.

This is a three-year study scheduled for completion in July 1969. The objectives are to: (a) determine the essential skills needed for selected entry occupations in distributive and office occupations; (b) determine the instructional units necessary to teach entry occupation skills; (c) develop a Senior Instructional Program to meet the entry job requirements; (d) prepare selected seniors to obtain and hold an entry job in selected distributive and office occupations; (e) place the school leavers in entry occupations selected with the cooperating employers, and (f) determine the school leaver's success on these jobs.

**A Planning Study To Determine the Feasibility of Developing a New Business and Office Education Curriculum.** Project No. 7-1223. Principal investigator: Frank W. Lanham, The National Center for Vocational and Technical Education, The Ohio State University.

The initial four-month feasibility study on the development of a major curriculum project in the office occupations has been completed. The precise objectives are now being obtained through a consortium approach, drawing upon the talents of personnel from such organizations as the National Business Education Association, Administrative Management Society, Business and Office Education Division of the American Vocational Association, and others. Attention will be directed toward determining the organizational structure for a major effort in curriculum redesign, and procedures for instituting a massive curriculum project.

**Establishment of a Course of Study in American Industry as a Transitional Subject Between General and Vocational Education.**

This study is being conducted at Stout State University in Menomonie, Wisc., under the direction of Wesley L. Face and Eugene R. F. Flug, and is scheduled for completion in June 1970. The actual curriculum is anticipated in the summer of 1969; the final evaluation is not expected until June 1970.

**The Efficacy of Home Economics Courses Designed To Prepare Disadvantaged Pupils for Their Homemaker-Family Member Role and Dual Roles of Homemaker and Wage Earner.** Project No. 7-0006.

Part A of this study is under the direction of Phyllis K. Lowe of Purdue University. Part B is being carried out at Cornell University, and Part C at The Ohio State University. The project is scheduled for completion in October 1969. The objectives are to investigate the impact that can be made on poverty in urban areas by (a) a newly designed home economics curriculum which prepares disadvantaged pupils for their roles as homemakers and family members in a changing society, and (b) a newly designed curriculum which prepares disadvantaged pupils for their dual roles of homemaker and wage-earner in occupation utilizing home economics knowledge and skills.

**Development of Performance Goals for a New Office and Business Education Learning System.** Project No. 8-0414. Principal investigator: Frank W. Lanham, The National Center for Vocational and Technical Education, The Ohio State University.

This project is scheduled for completion in December 1969. The purpose is to define a comprehensive, timely set of behavioral objectives for office and business education in public schools which can be approved by the business and office education profession and which are derived by explicit analysis of the performance requirements of tasks and of social roles in current and emerging occupations.

**A Junior High School Industrial Technology Curriculum Project.** Project No. 7-0003. Principal investigator: Edward R. Towers, The Ohio State University.

This project is scheduled for completion in June 1969. The first phase of this study (Project No. 5-0009) was reported on in the February 1968 issue of *Research Visibility*. The three major objectives of this project are to: (a) design an effective two-year articulated program of study for industrial arts in the junior high school; (b) develop the related teaching materials, and (c) install and evaluate the effectiveness of the program and materials.

**Development of Career Opportunities for Technicians in the Nuclear Medical Field.** Project No. 7-0313. Principal investigators: J. Paschal Twyman and James Potchen, Technical Education Research Center, Inc., Waco, Texas.

The overall objectives of this 12-month study are to analyze the employment opportunities in nuclear medical technology, and to develop and pilot test an integrated post-high school technical education program for nuclear medical technicians and nuclear medical research technicians.

**A Vocational-Technical Institute Development Program.** Project No. 6-2166. Principal investigators: David F. Shontz and Andreas Holmsen of the University of Rhode Island.

This study, scheduled for completion in August 1970, has these objectives: (a) to establish and evaluate a thirteenth and fourteenth year vocational-technical program in commercial fisheries, (b) and to develop and appraise an organized program of individual counseling, placement and follow-up of graduates.

## Police-Related Courses

Policemen who want more schooling are about to get a boost from Uncle Sam. A new Office of Academic Assistance is gearing up in the Department of Justice under a provision of the 1968 Omnibus Crime Control and Safe Streets Act. When it opens its doors, it will have $6.5 million in grants and loans for law-enforcement officers and students planning police careers. And in the next fiscal year it expects another $20 million.

Purpose of the aid, to be available for the January 1969 semester, is to bolster the size of local police forces as well as their social and professional stature.

Most police-related courses now are heavily concentrated in junior colleges. The new office, which would like to see these courses spread to four-year colleges, plans to set up model university police education programs.—*Christian Science Monitor*, Oct. 5, 1968.

**Development and Validation of Instructional Programs for the Allied Health Occupations.** Project No. 8-0627. Principal investigator: Melvin L. Barlow, University of California at Los Angeles.

This study is scheduled for completion in June 1972. The objective is to develop exemplary instructional programs for the continuing education of existing allied health personnel and for the preservice education of new allied health personnel at the community college level.

**Development and Evaluation of Educational Programs in Bio-Medical Equipment Technology.** Project No. 7-0973. Principal investigators: Roy W. Dugger and Edmund P. Garvey of the Technical Education Research Center, Inc., Waco, Texas.

This is a 27-month study. Phase I was reported on in the October 1968 issue of *Research Visibility*. The overall objectives are to develop, demonstrate, and evaluate a broad spectrum of post-high school educational programs in biomedical equipment technology.

**Development of Generalizable Education Programs in Laser and Electro-Optical Technology.** Project No. 8-0491. Principal investigator: Roy W. Dugger, Technical Education Research Center, Inc. of Waco, Texas.

This is a 12-month study. It has been estimated that by 1970 we will need 30,000 laser technicians in American industry. The overall objectives are to develop, pilot test and evaluate interdisciplinary post-high school technical education programs in laser and electro-optical technology.

**Development and Evaluation of a Concrete Technology Curriculum (Phase I).** Project No. 8-0042. Principal investigator: James D. Piper, Portland Cement Association.

The major objective of this three-phase study is to develop and evaluate a two-year, integrated curriculum designed to prepare persons for employment in the cement and concrete industries occupations. Phase I is to be of 18 months duration.

**Development and Evaluation of Educational Programs in Electro-Mechanical Technology.** Project No. 8-0219. Principal investigators: Maurice W. Roney and Roy W. Dugger of the Technical Education Research Center, Inc., Waco, Texas.

The purpose of this 33-month project is to develop, test, and evaluate a generalizable two-year associate degree type curriculum for electro-mechanical technicians in three pilot schools and to develop a set of integrated instructional and program planning materials.

## Reports From Organizations Under Contract to Federal Agencies

CFSTI, the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va., 22152, collects research reports from Government laboratories and industrial firms and private institutions under contract to sponsoring federal agencies. The Clearinghouse collection, dating back to 1946, contains more than 520,000 titles and is increasing at a rate of 50,000 titles per year.

Reports are announced in a semimonthly abstract journal, *U.S. Government Research and Development Report* (USGRDR), under 22 subject fields: Aeronautics; Agriculture; Astronomy and Astrophysics; Atmospheric Sciences; Behavioral and Social Sciences; Biological and Medical Sciences; Chemistry; Earth Sciences and Oceanography; Electronics and Electrical Engineering; Energy Conversion; Materials; Mathematical Sciences; Mechanical, Industrial, Civil and Marine Engineering; Methods and Equipment; Military Sciences; Missile Technology; Navigation, Communications, Detection, and Countermeasures; Nuclear Science and Technology; Ordnance; Physics; Propulsion and Fuels; and Space Technology.

A USGRDR *Index* is published concurrently and indexes each issue of USGRDR by subject, personal author, corporate author, contract number, and accession/report number. (Annual subscription rate for USGRDR is $30.00; for the USGRDR *Index*, $22.00.)

The most recent service of the Clearinghouse is the *Clearinghouse Announcements in Science and Technology* (CAST), designed for quick review of current scientific and technical reports which are broken down into 46 separate subject areas (*see below*). USGRDR contains all titles reviewed by the Clearinghouse, from which the CAST obtains its material by subject matter. (Annual subscription for this semimonthly service is $5.00 for the first category; for each additional two categories, $5.00) Below is a listing of the subject categories used in the CAST reports.

1. Aerodynamics and fluid mechanics
2. Aeronautics
3. Area development planning
4. Astronomy and astrophysics
5. Atmospheric sciences
6. Automation and data processing
7. Behavorial sciences
8. Biological sciences
9. Chemistry and chemical processing
10. Communications
11. Earth sciences
12. Economics
13. Electro-technology
14. Food and agriculture
15. Fuels and lubricants
16. Industrial engineering
17. Information sciences
18. Management planning
19. Marine technology
20. Materials
21. Mathematics and statistics
22. Mechanical engineering
23. Medical sciences
24. Metals and alloys
25. Military sciences
26. Navigation and detection
27. Nuclear Science
28. Oceanography
29. Operations research
30. Optics
31. Ordnance
32. Physics (general)
33. Physics (high energy)
34. Physics (solid state)
35. Plasma research
36. Plastics and elastomers
37. Power source devices
38. Propulsion systems
39. Reactor technology
40. Reprography and recording devices
41. Safety engineering
42. Social sciences and education
43. Space mechanics
44. Space vehicles
45. Testing and analysis
46. Transportation.

Documents reported by the Clearinghouse in any of the above publications are available in microfiche and paper copy. Regardless of the size of the document, the cost remains constant at $3.00 for paper copy, and $0.65 for a microfiche copy. The Clearinghouse requires prepayment on all orders, and recommends the use of document coupons to expedite processing of orders (use of coupons provides a two-to-four day service).

The coupons may be obtained from the Clearinghouse: book of 10 paper copy coupons for $30.00; a book of 50 microfiche coupons for $32.50. Documents are ordered according to an accession number; if the number is not known, the complete title and other identifying information may be used: contract number, sponsoring federal agency, author, or source of information.

The Clearinghouse also has a *Fast Announcement Service* (FAS) which highlights selected new Government R&D reports, utilizing a subject system of 57 categories. Fast Announcements are also sent to trade and technical press for re-announcemnt. (Annual subscription rate: $5.00.)

# PLAIN TALK

THERE IS MORE than a little consensus among vocational education scholars that *curriculum* in vocational and technical education constitutes the *major* professional problem. A corollary statement or assumption, and one strongly related to both research and curriculum, indicates the probability that less investigation and research is devoted to curriculum than to other major problem areas of the field. Traditionally, at least, there is strong kinship and mutuality in the nature of the overall research and curriculum problems; both areas of concern suffer from (a) lack of time, resources, and effort to clarify their focus and function, (b) lack of relationship and coordination, and (c) effective dissemination and communication.

Happily in the spirit and language of the Vocational Education Amendments of 1968, an overdue shot-in-the-arm is given to curriculum development. Admittedly, Congress sees several complications related to curriculum development: (a) diversity of program purposes, (b) geographical differences, (c) differences in school levels and programs, and (d) the wide range and scope of occupations. The Congress also makes no bones about the necessity of curriculum development for new and changing occupations, and the improvement, coordination and dissemination of curriculum materials.

Congressional *intent* in the uses of funds, therefore, is very specific and far-reaching: (a) development and dissemination of materials, (b) development of standards for curriculum development, (c) coordination of State efforts in preparation of materials and their availability, (d) survey of materials produced by other agencies, particularly the Department of Defense, (e) evaluation of materials and their uses, and (f) training of personnel in curriculum development.

***Balances and Imbalances in the New Vocational Curriculum.*** Few legislative bills of the past have reflected the American educational dream—the *optimum* development of each person—which is the *spirit* of VEA 1968. To vocational educators, at least, this spirit must be confronted and greatly implemented. The confrontation demands the re-examination of purposes and great sensitivity to *balance* in the overall curriculum of vocational and technical education. A strong case in point is the importance (and legislative provisions) attached to *cooperative vocational education programs, work study programs,* and what may be termed "occupational orientation" (the focus of *exemplary* programs and projects). None of these is a stranger to vocational education. Despite their relatedness, they are not interchangeable; neither do they serve the same function. Little short of tragedy, certainly student exploitation will occur if cooperative vocational education becomes work-study.

Precise educational planning and coordination, the heart of cooperative education, is less critical and demanding in the work-study program with its *general* relatedness to the values of work and employment. *Occupational orientation* as a descriptor for acquaintanceship and familiarity with the world of work should be a general purpose and function of American schools for all Americans. The professional vocational community will need to exercise a great deal of discrimination and insight into the examination and delineation of program purposes, appropriate curriculum, and expected student outcomes and behaviors to achieve the degree of balance over the entire range of vocational and technical education.

***From Here and There:*** Mid-winter literature is rich in information and implications for research and curriculum. Do you know about:

*Abstracts of Instructional Materials in Vocational and Technical Education (AIM).* AIM announces the availability of documents acquired and processed by the ERIC Clearinghouse on Vocational and Technical Education at The Ohio State University. Included are abstracts of materials typically designed for teacher use or student use in the classroom, and annotations of bibliographies or list of instructional materials. It will be of particular interest to teachers, curriculum specialists, supervisors and administrators involved in the use of instructional materials in the teaching-learning setting, or in curriculum development.

AIM is published quarterly (Fall, Winter, Spring, Summer). The first issue was the Fall 1967 issue. It is available by subscription for $9.00 per year. Send order, indicating quarter and year that subscription is to begin, to: Publica-

tions Clerk, The National Center for Vocational and Technical Education, 1900 Kenny Road, Columbus, Ohio 43212.

*Planning and Designing Functional Facilities for Industrial Arts Education.* USOE Specialists Marshall L. Schmidt and James L. Taylor have co-authored a 54-page timely publication which generally treats trends and the emerging program, planning, space and facilities needed, the general physical environment, and provides an excellent summary and recommendations. The publication (OE-51015) is available from the Government Printing Office, Washington, D.C. 20402 for 45 cents.

*Defense Industry Bulletin.* Technical education personnel will be particularly interested in this free monthly bulletin (see *RV* bibliography for availability details). Although it is primarily intended for industry and industrial representatives, it is a rich source of technical and research information related to the Department of Defense. In addition to five or six feature articles of interest to technical manpower, the *Bulletin* has continuing departments, one of which is a bibliography of publications and research reports.

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CFSTI—Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Copies of reports with this symbol may be purchased for $3 each (paper) or 65 cents (microfiche). Send remittance with order directly to the Clearinghouse and specify the accession number (AD or PB plus a 6-digit number) given in the listing.

ERIC—Educational Resources Information Center, EDRS, c/o NCR Co., 4936 Fairmont Ave., Bethesda, Maryland 20014. Copies are priced according to the number of pages. The MF price in the listing is for microfiche; the HC price is for paper copies. Send remittance with order directly to ERIC-EDRS and specify the accession number (ED plus a 6-digit number) given in the listing. *How to Use ERIC*, a recent brochure prepared by the Office of Education, is available from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402; the catalog number is FS 5.212.12037; price: 20 cents.

GPO—Government Printing Office. Send orders directly to Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402, with remittance for specified amount.

MA—Manpower Administration. Single copies free upon request to U.S. Department of Labor, Manpower Administration, Associate Manpower Administrator, Washington, D. C. 20210

OTHER SOURCES—Where indicated the publication may be obtained directly from the publisher at the listed price.